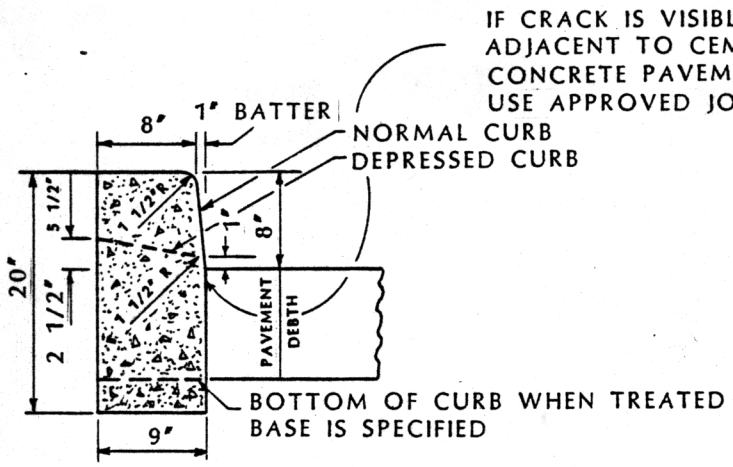
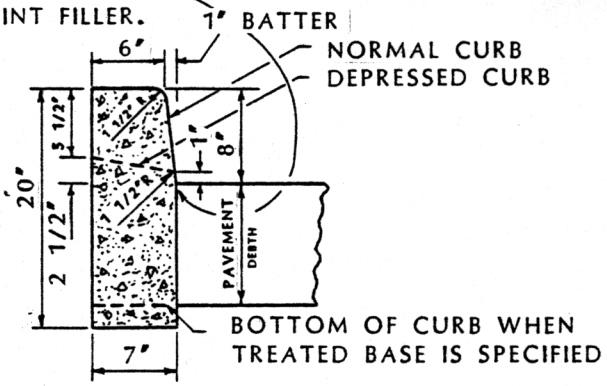
PART IV
STANDARDS & SPECIFICATIONS

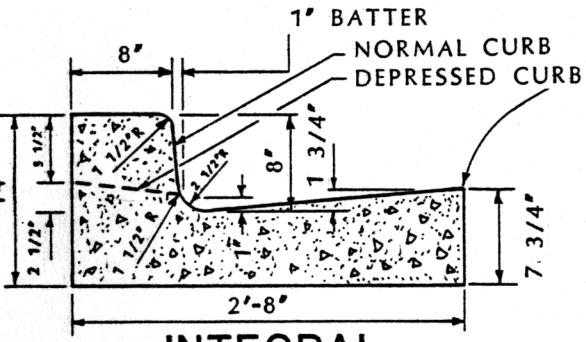
TYPES OF STANDARD CURBS



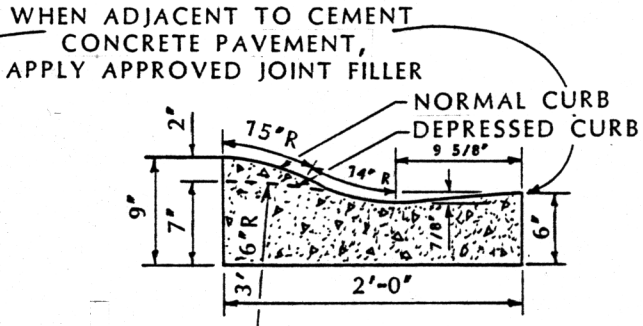
P.C.C. CURB
TYPE 1



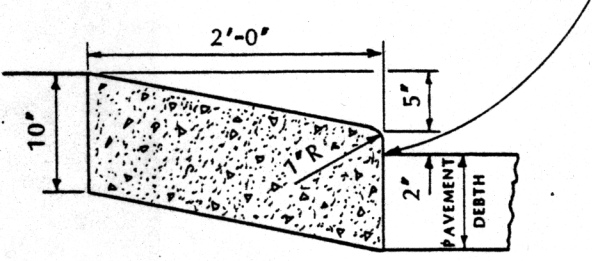
P.C.C. CURB
TYPE 2



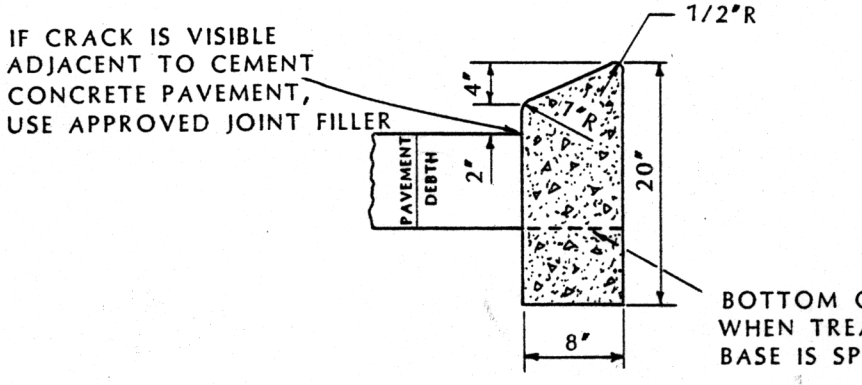
INTEGRAL
P.C.C. CURB & GUTTER
TYPE 1



* INTEGRAL P.C.C. CURB & GUTTE
TYPE 2

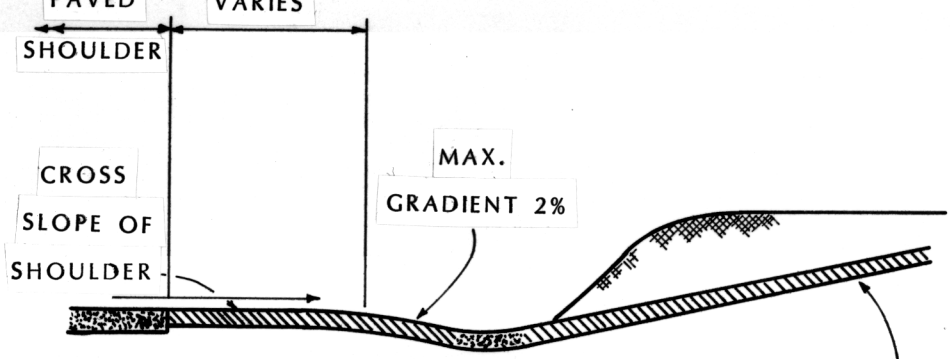


* P.C.C.
PARKWAY CURB
TYPE 1



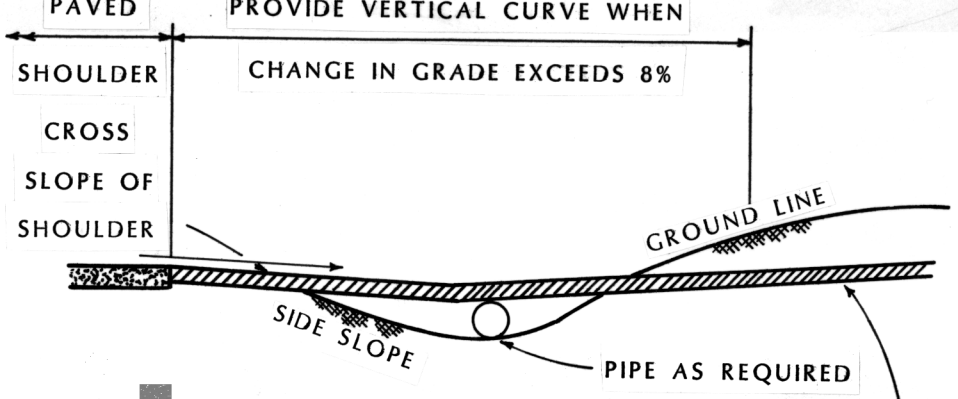
* P.C.C. PARKWAY CURB
TYPE 2

* MOUNTABLE TYPE CURBS



DRIVEWAY WITH SWALE

DRIVEWAY MAX. GRADIENT
8% COMMERCIAL
10% RESIDENTIAL



DRIVEWAY IN CUT SECTION

DRIVEWAY MAX. GRADIENT
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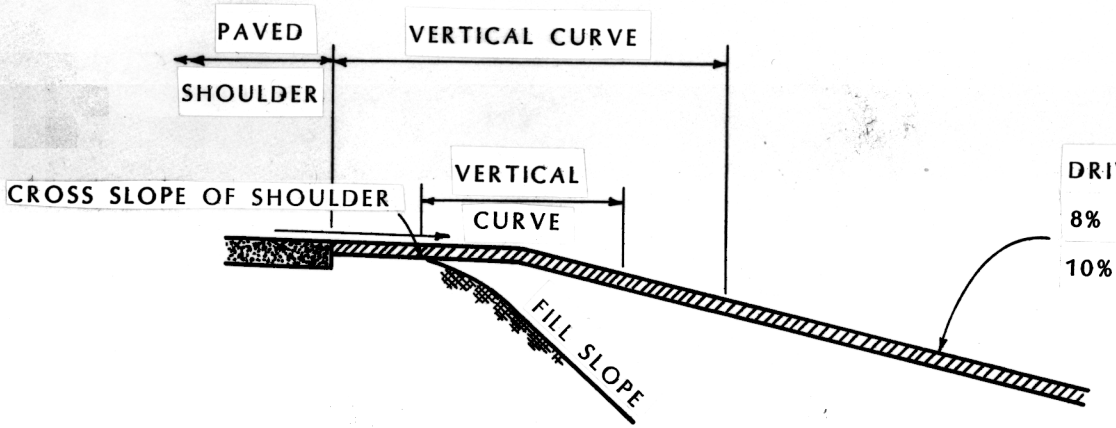
10% RESIDENTIAL

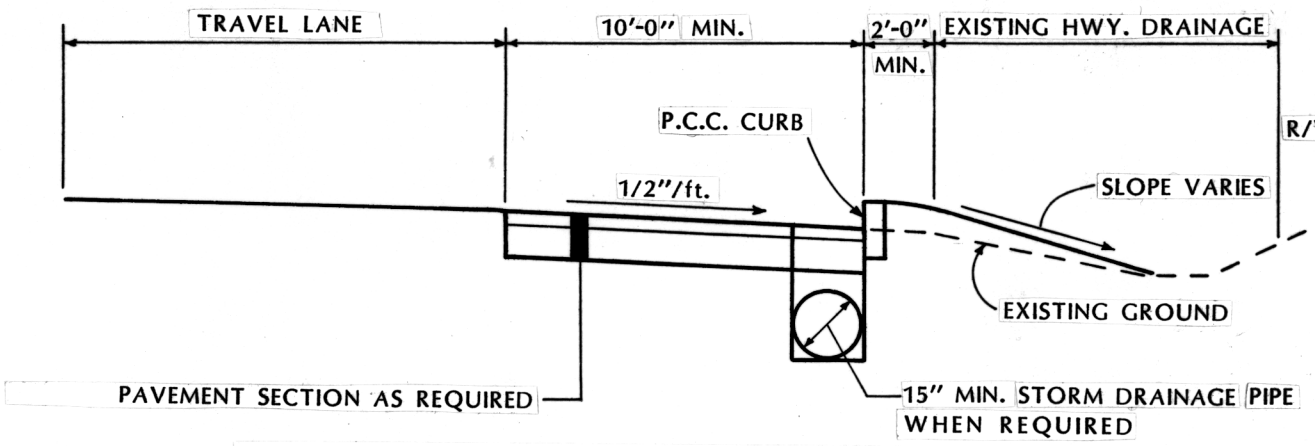


DRIVEWAY AT FILL SECTION

DRIVEWAY MAX. GRADIENT
8% COMMERCIAL
10% RESIDENTIAL

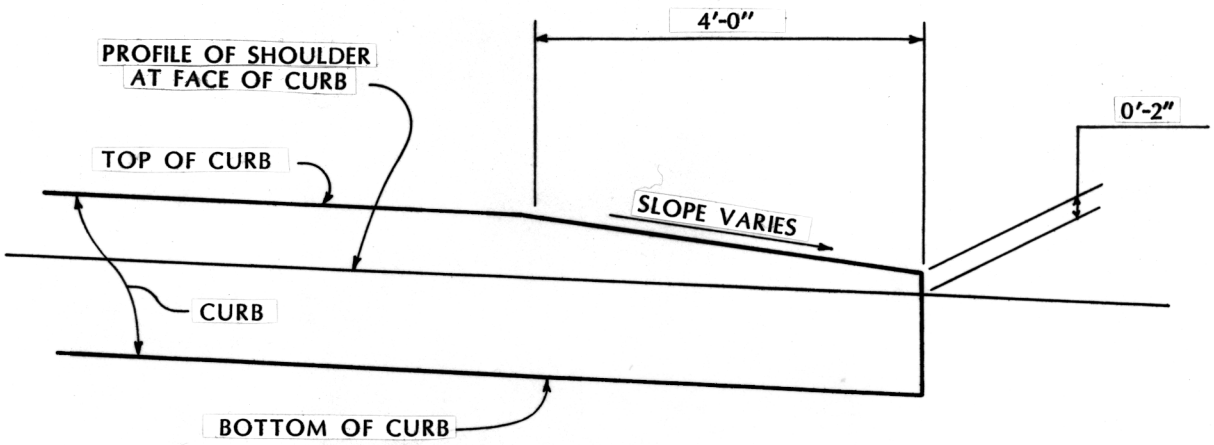
WITHOUT HIGHWAY EDGE CURB

DRIVEWAY PROFILE CONTROLS

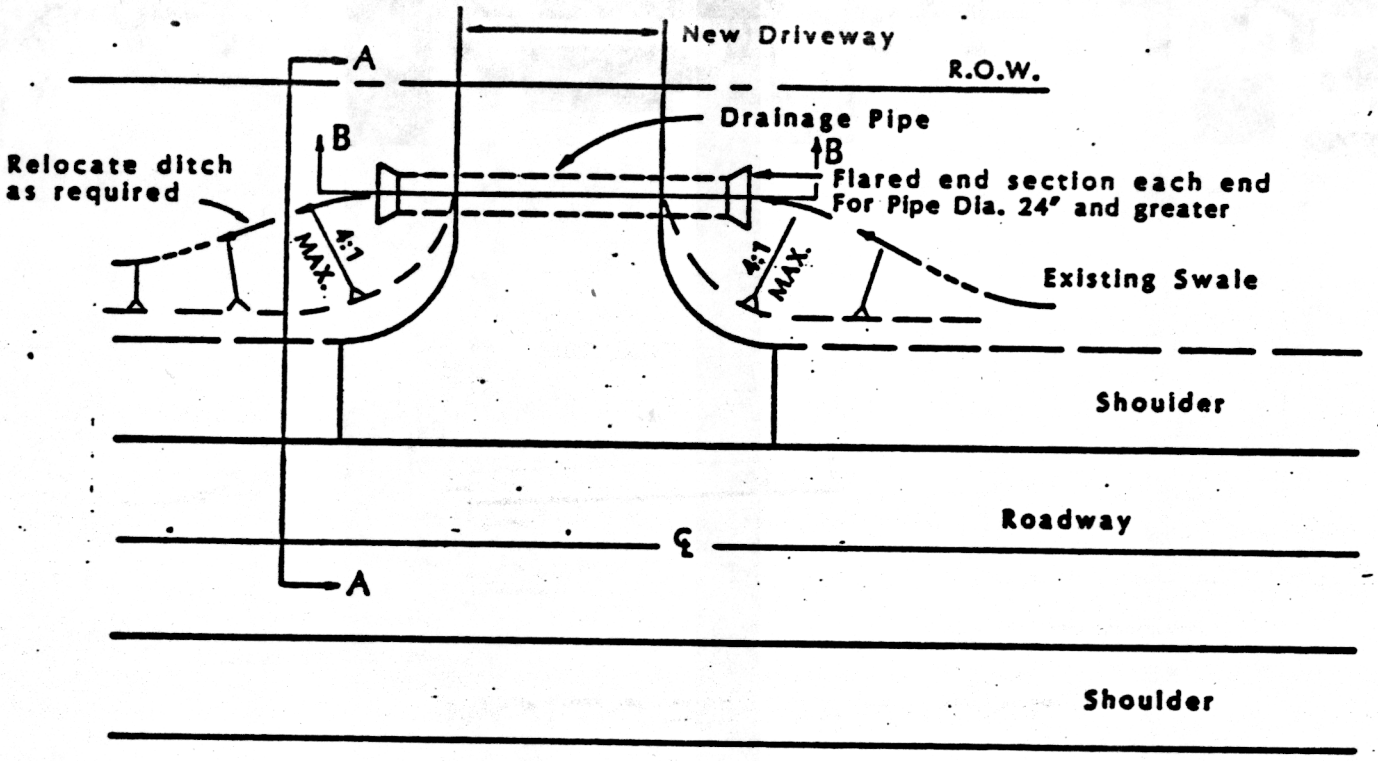


TYPICAL SECTION

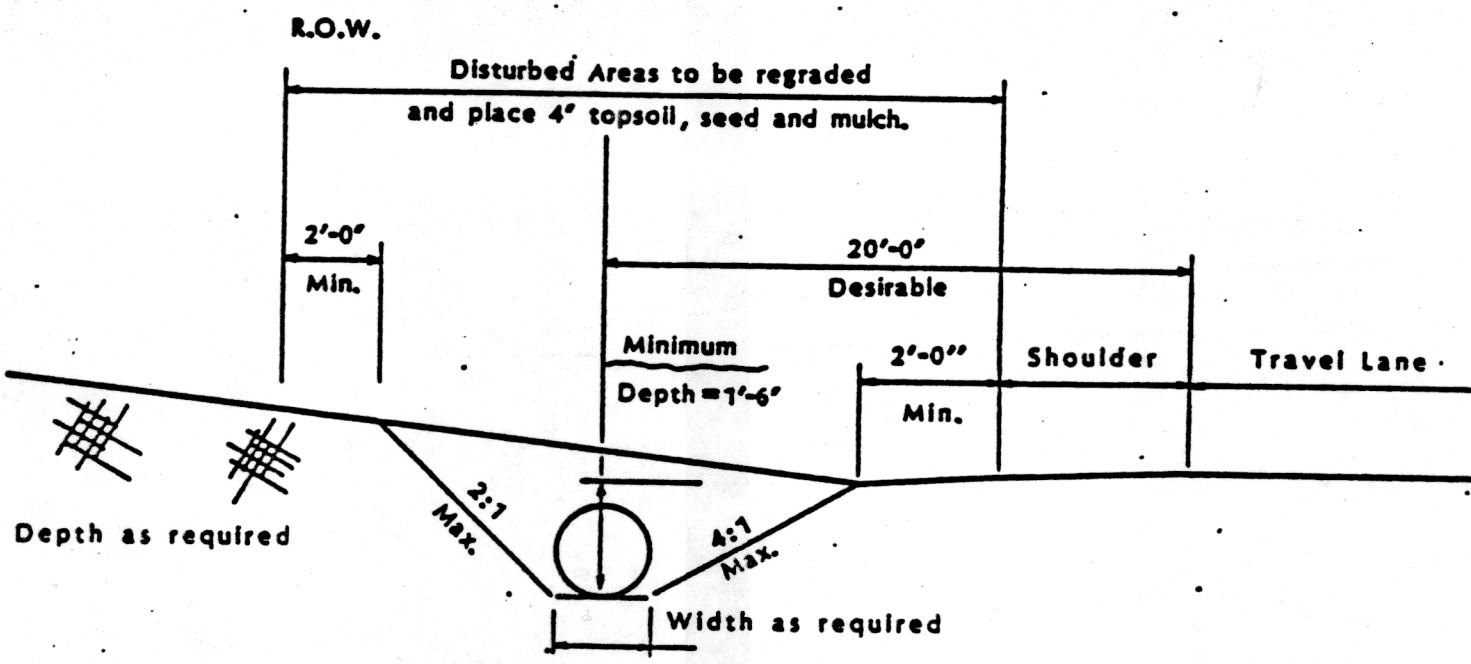
RIGHT TURN DECELERATION LANE



TYPICAL DETAIL AT END OF CURB

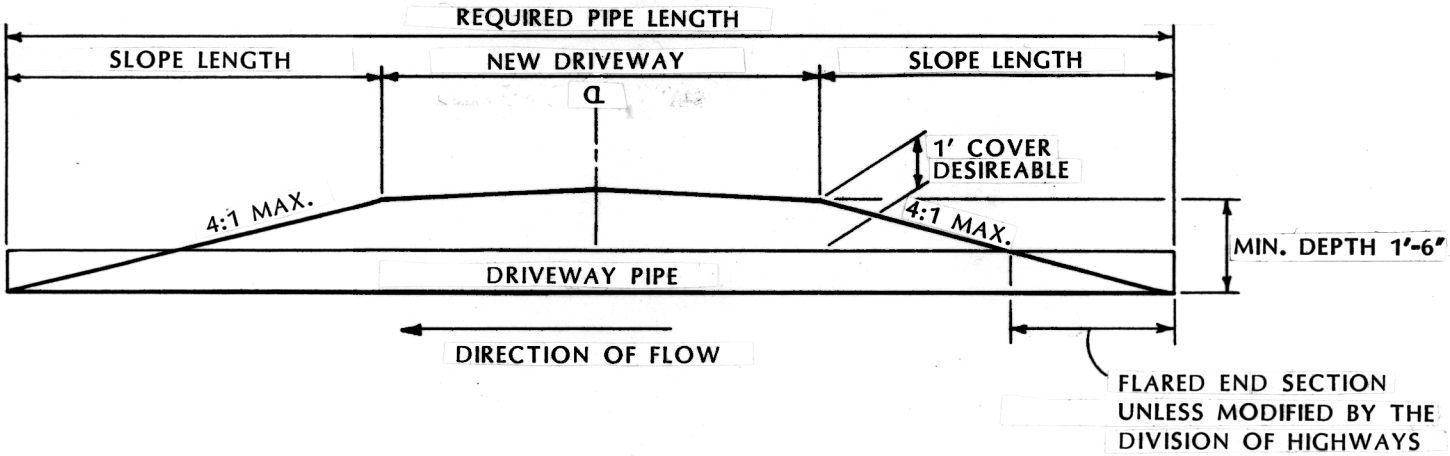


PLAN VIEW
(NO SCALE)



SECTION A-A
(NO SCALE)

TYPICAL DRIVEWAY PIPE INSTALLATION



TYPICAL DRIVEWAY PIPE INSTALLATION

SECTION B-B

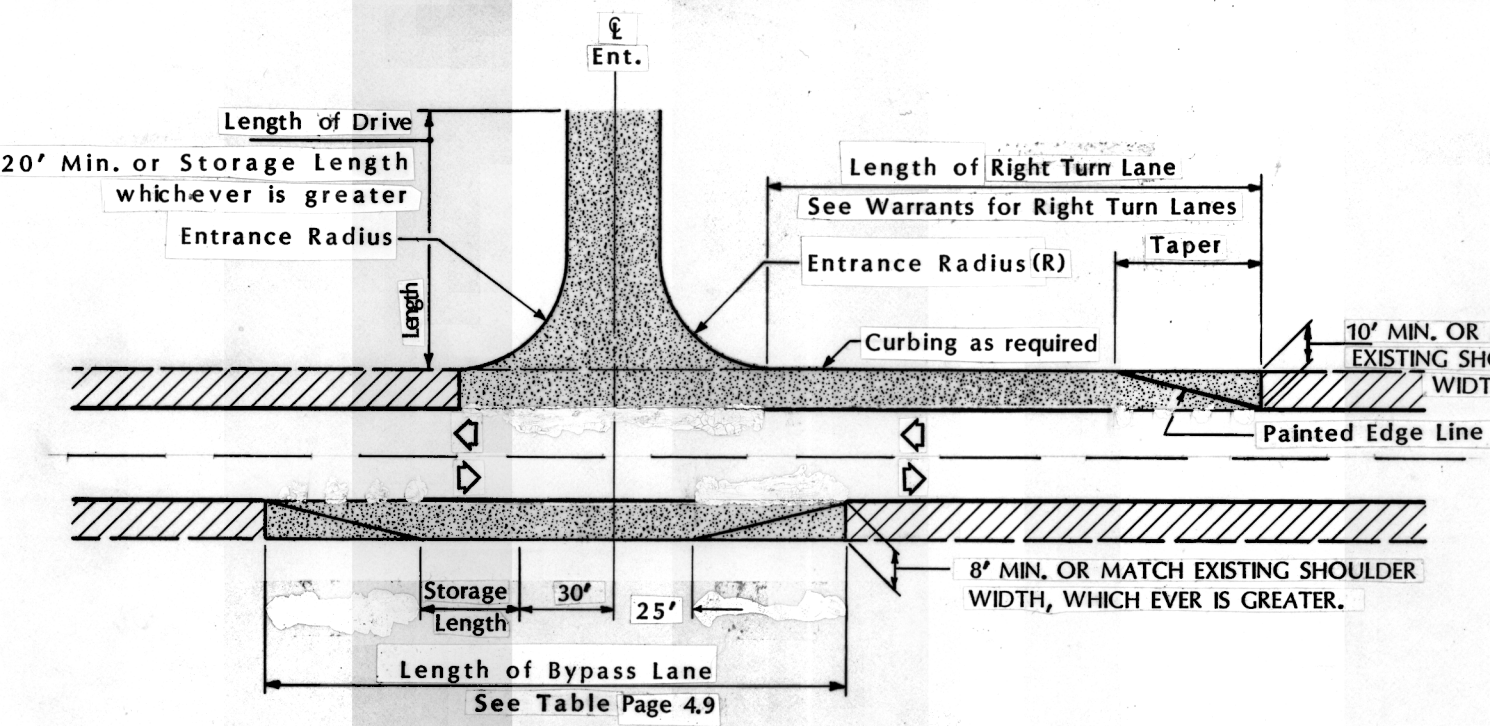
(No Scale)

AASHTO
DECELERATION & TAPER LENGTHS

ASSUMED APPROACH SPEED MPH	DECELERATION LENGTH		TAPER LENGTH FT.
	STOP CONDITION	15 MPH	
25	200 FT.	150 FT.	50 FT.
30	235	200	90
35	275	250	140
40	315	300	190
45	375	350	210
50	435	400	230
55	480	450	250

NOTES: 1. Decel Length includes Taper Length

2. This table is based on AASHTO Requirements. Length of right turn lane in following tables are prorated based on Highway/Entrance ADT and speed.



TYPICAL ENTRANCE

REQUIRED ON 2 LANE UNDIVIDED ROADWAY

WARRANTS RIGHT TURN LANE STOP CONDITION

(R=50' or Less)

HIGHWAY ADT < 2000 VEHICLES

RIGHT TURN ADT	Assumed Speed Change on THROUGH LANE	HIGHWAY POSTED SPEED							
		25 MPH		35 MPH		50 MPH		55 MPH	
		TAPER	DECEL	TAPER	DECEL	TAPER	DECEL	TAPER	DECEL
0-100	Full Reduction	—	—	—	—	—	—	—	—
100-200	Full Reduction	—	—	—	—	—	—	—	—
OVER 200	25 MPH	—	—	—	—	50	200	—	—

HIGHWAY ADT 2000 TO 4000 VEHICLES

0-100	Full Reduction	—	—	—	—	—	—	—	—
100-200	25 MPH	—	—			50	200	—	—
200-300	20 MPH	ENGINEER JUDGEMENT				90	235	—	—
300-400	15 MPH					140	275	—	—
OVER 400	10 MPH			50	200	190	315	—	—

HIGHWAY ADT 4000 TO 10,000 VEHICLES

0-50	Full Reduction	—	—	—	—	—	—	—	—
50-100	20 MPH	ENGINEER JUDGEMENT				90	235	—	—
100-200	15 MPH					140	275	—	—
200-400	10 MPH			50	200	190	315	—	—
OVER 400	5 MPH			90	235	210	375	—	—

HIGHWAY ADT OVER 10,000 VEHICLES AND DIVIDED HIGHWAYS

0-50	Full Reduction	—	—	—	—	—	—	—	—
50-100	15 MPH	ENGINEER JUDGEMENT				140	275	190	315
100-200	10 MPH			90	235	190	315	210	375
200-400	5 MPH			90	235	210	375	230	435
OVER 400	0 MPH	50	200	140	275	230	435	250	480

NOTE: DECEL LENGTH INCLUDES TAPER

WARRANTS RIGHT TURN LANE

15 MPH

(R=50' or Greater)

HIGHWAY ADT < 2000 VEHICLES

RIGHT TURN ADT	Assumed Speed Change on THROUGH LANE	HIGHWAY POSTED SPEED							
		25 MPH		35 MPH		50 MPH		55 MPH	
		TAPER	DECEL	TAPER	DECEL	TAPER	DECEL	TAPER	DECEL
0-100	Full Reduction	—	—	—	—	—	—	—	—
100-200	Full Reduction	—	—	—	—	—	—	—	—
OVER 200	25 MPH	—	—	—	—	50	150	—	—

HIGHWAY ADT 2000 TO 4000

0-100	Full Reduction	—	—	—	—	—	—	—	—
100-200	25 MPH	—	—	ENGINEER JUDGEMENT		50	150	—	—
200-300	20 MPH					90	200	—	—
300-400	15 MPH					140	250	—	—
OVER 400	10 MPH			50	150	190	300	—	—

HIGHWAY ADT 4000 TO 10,000 VEHICLES

0-50	Full Reduction	—	—	—	—	—	—	—	—
50-100	20 MPH	ENGINEER JUDGEMENT				90	200	—	—
100-200	15 MPH					140	250	—	—
200-400	10 MPH			50	150	190	300	—	—
OVER 400	5 MPH			90	200	210	350	—	—

HIGHWAY ADT OVER 10,000 VEHICLES AND DIVIDED HIGHWAYS

0-50	Full Reduction		—	—	—	—	—	—	—
50-100	15 MPH	ENGINEER JUDGEMENT				140	250	190	300
100-200	10 MPH			90	200	190	300	210	350
200-400	5 MPH			90	200	210	350	230	400
OVER 400	0 MPH	50	150	140	250	230	400	250	450

NOTE: DECEL LENGTH INCLUDES TAPER

REQUIRED LENGTH OF BYPASS LANES FOR TWO LANE HIGHWAYS

HIGHWAY ADT < 2000 VEHICLES

LEFT TURN ADT	STORAGE LENGTH (FT.)	TAPER LENGTH (FT.) HIGHWAY POSTED SPEED			ASSUMED SPEED CHANGE ON THROUGH LANE
		25 MPH	35 MPH	50 MPH	
0-50	—	—	—	—	—
50-200	—	—	—	—	—
OVER 200	40	50	50	75	25

HIGHWAY ADT 2000 TO 4000 VEHICLES

0-100	—	—	—	—	—
100-200	40	50	50	75	25
200-300	60	50	50	100	20
300-400	80	50	50	125	15
* OVER 400	CONSIDER SEPARATE LEFT TURN				

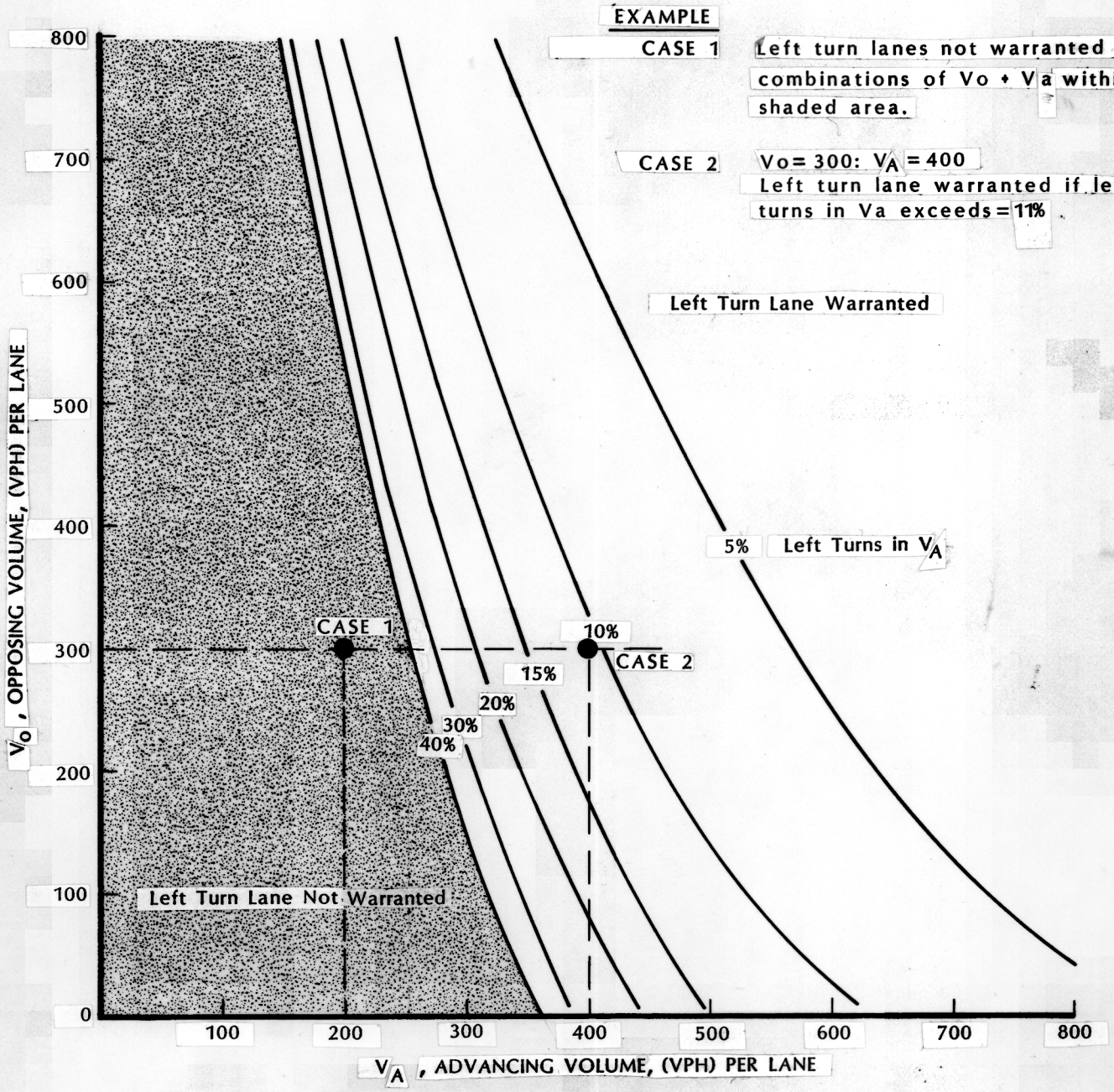
HIGHWAY ADT OVER 4000 VEHICLES

0-50	—	—	—	—	—
50-100	20	50	50	100	20
100-200	40	50	50	125	15
200-400	80	50	75	150	10
* OVER 400	CONSIDER SEPARATE LEFT TURN				

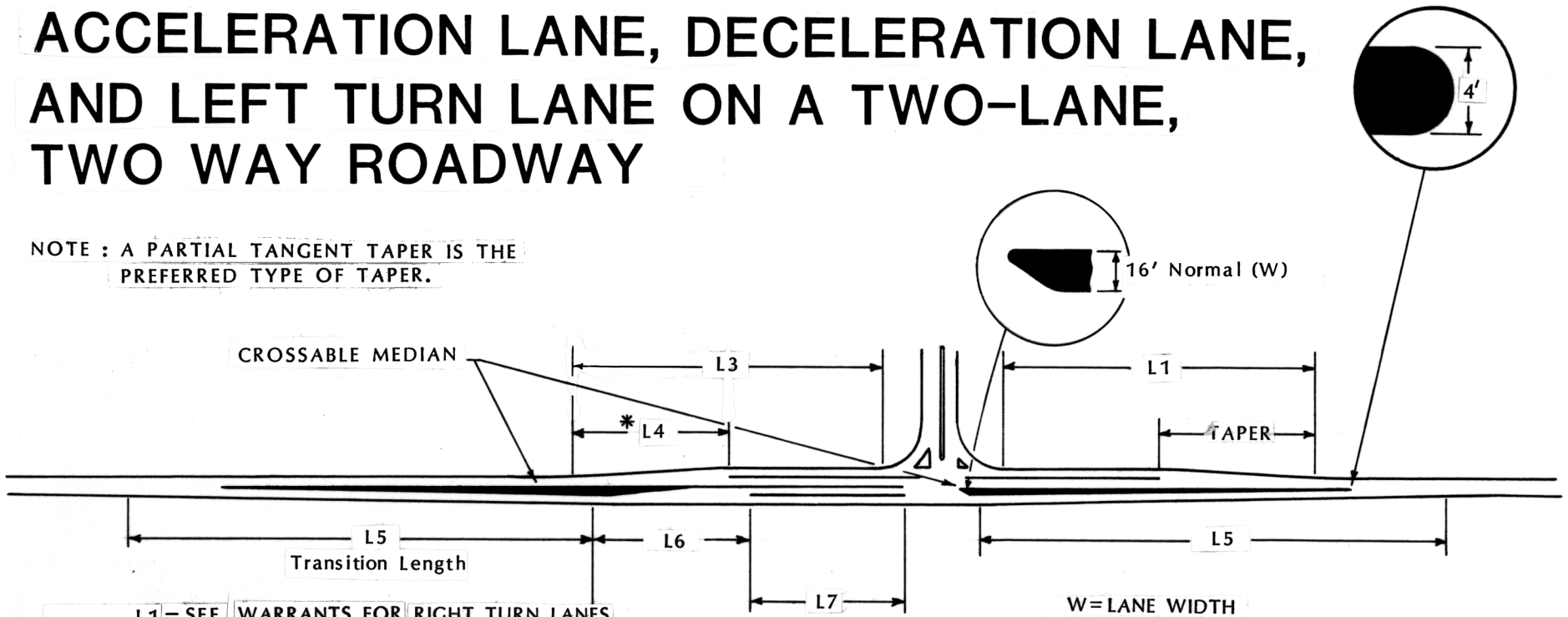
$$\text{STORAGE LENGTH} = \frac{\text{ADT} \times .20}{30} \times 20 \text{ FT.} \times 1.5$$

* See Warrant for Left-Turn Lane found on page 4.10 of this policy.

VOLUME WARRANTS FOR LEFT-TURN LANE



ACCELERATION LANE, DECELERATION LANE, AND LEFT TURN LANE ON A TWO-LANE, TWO WAY ROADWAY



NOTE : A PARTIAL TANGENT TAPER IS THE PREFERRED TYPE OF TAPER.

L1 = SEE WARRANTS FOR RIGHT TURN LANES
L3 = SEE CHART BELOW (May be required when right turn VPH > 100)
L5 = 200' MINIMUM OR $\frac{WS}{2}$ WHICH EVER IS GREATER
L6 = 100' (TAPER)
L7 = MIN. 100' OR

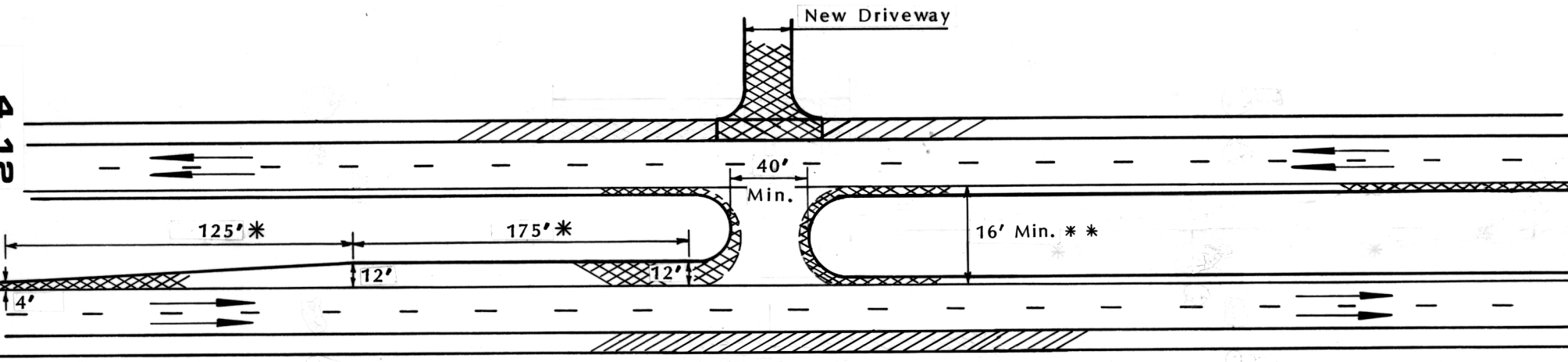
100	200	300	TURNING VEH./HR.
100'	175'	250'	REQUIRED STORAGE LENGTH

W = LANE WIDTH
S = POSTED SPEED OF HIGHWAY
* L4 = 50:1 TAPER , 75' MIN.

HIGHWAY DESIGN SPEED , MPH	L3 = ACCELERATION LENGTH-FEET FOR ENTRANCE CURVE DESIGN SPEED , MPH			
	STOP CONDITION	15	20	25
30	190			
35	285	240	190	170
40	380	320	250	220
45	570	510	440	400
50	760	700	630	580
55	965	910	850	790

MEDIAN STRIP : URBAN AREA = PARKWAY TYPE CURB
RURAL AREA = PAINTED

STANDARD CROSSOVER DESIGN



* * When the existing median is less than 16' wide see page 4-11 for transition lengths of the approaching roadway.

DETAIL FOR CROSS-OVERS

* MINIMUM LENGTH REQUIRED.
SEE A A S H T O DECEL AND TAPER LENGTHS PAGE 4.6
These lengths shall be increased for vehicular storage in accordance with :

Storage length $\frac{\text{ADT X.20 X 20 X 1.5}}{30}$

where : (ADT X.20)= assumed VPH

Pavement Design for Commercial Entrances to State Maintained Highways

1. Class of Entrance to highway based on site generated traffic

   Class A - Traffic volume less than 50 ADT
   - No trucks

   Class B - Traffic volume 50 to 500 ADT and/or
   - No Trucks

   Class C - Traffic volume 500 to 2000 ADT and/or
   - Less than 15 trucks per day

   Class D - Traffic volume 2000 to 5000 ADT and/or
   - Less than 50 trucks per day

   Class E - Traffic volume in excess of 5000 ADT and/or
   - Over 50 trucks per day

2. Pavement Section for entrance to highway, acceleration-deceleration lanes and bypass lanes. The pavement section for entrances to subdivision streets shall be the same as the subdivision street section.

PAVEMENT REQUIREMENTS

	Required Structural Number		Example of Pavement	
Class	Good Soil	Poor Soil	Good Soil	Poor Soil
A	SN - 1.20-	SN - 2.40-	Bituminous Surface Treatment (3-course) 10" Crusher Run or 6" CR-1	2" - C 8" - CR-1 SN - 2.40
B	SN - 1.60	SN - 2.40	2" - C 10" - Select SN - 1.60	2" - C 8" - CR-1 SN - 2.40

PAVEMENT REQUIREMENTS

Class	Required Structual Number		Example of Pavement	
	Good Soil	Poor Soil	Good Soil	Poor Soil
C	SN - 2.50	SN - 3.20	1 1/4" - C 1 3/4" - B 7" - CR-1	1 1/4" - C 1 3/4" - B 8" - CR-1 6" -Select
			SN - 2.60	SN - 3.28
D	SN - 3.30	SN - 4.00	1 1/2" - C 2 1/2" - B 9" - CR-1	1 1/2" - C 2 1/2" - B 6" -Select
			SN - 3.40	SN - 4.08

E. Requires Detailed Pavement Designs

Notes:

Trucks - other than panel or pick up truck

Good Soil - All soils within the A-1, A-2, A-3, AASHTO Soil Classification

Bypass Lanes - Bypass lanes are provided in the existing shoulder area on two lane roads. In the event that an exclusive left turn entrance lane is required, pavement widening for the thru traffic shall be designed for the full traffic load of the existing highway.

ADT - Total one way trips utilizing the subdivision or commercial entrance.

Soil Type - The Division may require a soils study for the purpose of classifying soils. In the event soils data is not available the

pavement sections shall be based on poor soils.

Existing Pavement - The construction of auxiliary lanes may require an overlay of the existing pavement.

3. Pavement Section for Pavement Widening

The pavement section for a widening of the existing roadway to provide an exclusive left turn entrance lane as part of the entrance to State Highways shall be designed to carry the full traffic load of the existing roadway. The pavement section submitted by the developer for a pavement widening shall be designed in accordance with the procedures detailed below:

The designer should first obtain the following traffic data for the existing highway:

a) Average Annual Daily Traffic (AADT)

b) Truck Percentage of AADT (% Trucks)

c) Truck Weight Pattern

(This information is available from the Department upon request. Normally it will come from the most recent Traffic Summary and be immediately available. In some cases the Department may determine that a special traffic count and/or classification study is necessary, in which case information will not be immediately available.)

The Truck Weight Pattern is used with the following chart to select an 18,000 lb. (18 kip) equivalency factor:

Truck Weight Pattern	18 kip Equivalency Factor
1	0.20
2	0.30
3	0.60
4	0.80
5	1.10
6	1.20
7	1.50

The following formula is then used to determine the daily number of 18 kip axle loadings expected on this pavement:

$$\text{A.A.D.T.} \times 1/2 \times \%\ \text{Trucks} \times \underset{\text{Factor}}{\text{18 Kip Equivalency}} = \underset{\text{Loadings}}{\text{Number of 18 kip Axle}}$$

The above procedure converts all truck traffic in one direction to an equivalent number of passes of a single axle carrying 18,000 lb. Car traffic is neglected due to its minor influence.

This equivalent number of 18 kip single axle loadings is then used with the following chart to determine the strength or Structural Number required for the pavement widening.

Number of 18 kip Axle Loadings	Required Structural Number (S.N.) Good Soil*	Poor Soil*	Example Pavement Sections Good Soil	Poor Soil
1-20	2.0	2.8	1 1/4" C Hot Mix 1 3/4" B Hot Mix 6" Crusher Run SN = 2.04	1 1/4" C Hot Mix 1 3/4"B Hot Mix 8" Crusher Run 6" Select Borrow SN = 2.80
21-50	2.4	3.2	2" C Hot Mix 5" Bit. Base SN = 2.40	2" C Hot Mix 6" Bit. Base 6" Select SN = 3.20
51-100	2.8	3.6	1 1/4" C Hot Mix 1 3/4" B Hot Mix 5" Bit. Base SN = 2.80	1 1/4" C Hot Mix 1 3/4" B Hot Mix 5" Bit. Base 6" Crusher Run SN = 3.64
101-300	3.2	4.0	1 1/2" C Hot Mix 2 1/2" B Hot Mix 8" CR-1 SN = 3.20	2" C Hot Mix 3" Hot Mix 10" CR-1 SN = 4.00
301-600**	3.6	4.4	2" C Hot Mix 3" B Hot Mix 5" Bit. Base SN = 3.60	2" C Hot Mix 3" B Hot Mix 6" Bit. Base 6" Select Borrow SN = 4.40

*Good soils are those falling within the A-1, A-2, and A-3 American Association of State Highway and Transportation Officials (AASHTO) soil classifications. Poor soils are those falling within the A-4, A-5, A-6, and A-7 AASHTO soil classifications. The developer is encouraged to investigate the soils conditions at the proposed entrance. If results verify good subgrade soils, a lighter pavement section may be used. The developer may elect, however, to assume poor subgrade soil conditions and build the heavier section without performing a soils investigation. Requirements and procedures for soils investigation work are available from the Department.

**Pavement widening to serve over 600 18 kip axle loads per day will be designed by the Department.

The pavement section for pavement widening must be at least equivalent to the existing pavement.

The Department may require a 1½" Hot Mix Type C overlay of the existing roadway in order to deleniate new pavement stripping required for the left turn lane.

In areas where skidding accidents could result from the traffic using this entrance the Department may require the developer to place a one inch thickness of open graded hot mix over the existing roadway to improve skid resistance of the pavement.

All construction shall be in accordance with the Department's Standard Specifications.

4. Below is a tabulation of materials, their use within the pavement section, and their structural value.

Use	Material	Structural Number For Inch Thickness
Surface Course	Type C Hot Mix	0.40
Binder Course	Type A Hot Mix	0.35
	Type B Hot Mix	0.40
Base Course	Select Borrow	0.08
	Quarry Waste	0.11
	Crusher Run	0.14
	Pre-Mixed (CR-1)	0.20
	Soil Cement (6% Cement 1%)	0.20
	Bituminous Concrete	0.32